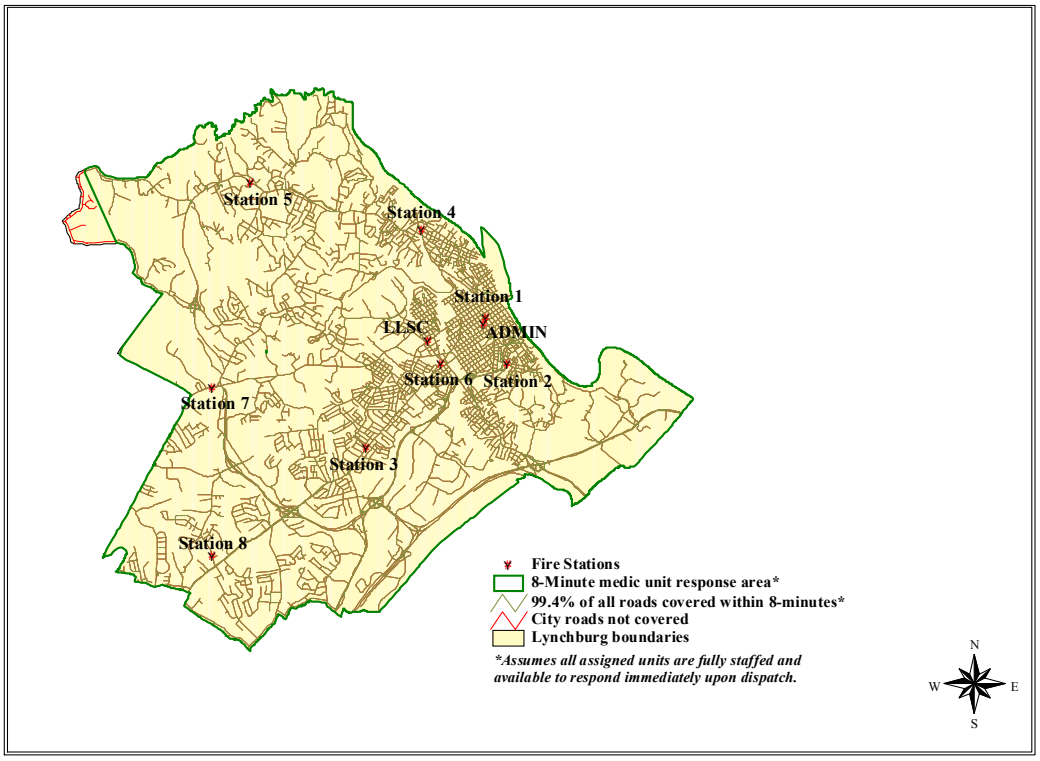
The map below shows those areas that are predicted to be covered by an ALS unit within eight (8) minutes. Apparatus may reach 99.4 percent of roads within (8) minutes. [17]

Map 6.10 **Eight-Minute ALS Medic Unit Response Area**[18]



Areas that are outside of the 8-minute travel time objective are portions of Hawkins Mill, Wiggington and Coffee Roads.

Unit Performance

Analysis of the concentration of units during 2002, 2003, and 2004 combined (shown in the table below) led to the following conclusions measured against the adopted standards, NFPA 1710 and OSHA standards for response to structure fires. Responses to the entire fire protection area were included, because OSHA standards apply to all structure fire response, and NFPA 1710 does not distinguish between different risk areas for this purpose. The below table includes the full complement total reflex time for structure fires.

[17] Ibid.
[18] Ibid.

Table 6.1 **Total Reflex Time: Structure Fires (Full Complement): 2002-2004**

Element	Adopted Standard	80th Percentile	90th Percentile	90th Percentile, Total Elapsed Time Since Initial Dispatch
Alarm Processing	1:00	1:18	1:27	
Turnout, First in Engine	1:00	0:58	1:04	
Travel, First in Engine	4:00	3:02	3:28	4:32
Travel, Second in Engine	8:00	4:18	4:39	5:43
Travel, Third in Engine	8:00	4:59	5:22	6:26
Travel, First in Truck	8:00	4:32	4:58	6:02
Travel, First in Rescue	8:00	5:20	5:36	6:40
Travel, First in Medic	8:00	3:49	4:05	5:09
Travel, First in Battalion Chief	8:00	4:33	4:47	5:51
Travel, Full Complement	8:00	5:20	4:45	6:40
Total Reflex Time (Customer Interval)	10:00	7:36	8:07	

- Alarm processing time at the 90th percentile is 1:27, which is over the one-minute alarm processing time standard by 27 seconds.
- Turnout time at the 90th percentile was 1:04, which is over the one-minute turnout time standard by 4 seconds.
- 1st engine travel time at the 90th percentile was 3:28, which is under the four-minute travel time standard by 32 seconds.
- 2nd engine is the usual method of meeting the OSHA Two-In/Two-Out rule. Travel time for the 2nd engine at the 90th percentile was 4:39.
- The department met the deployment standard of 15 firefighters on scene on all structure fires, and the travel time was 4:45 at 90th percentile, meeting the 8-minute standard time by 3:15.

The data shows that LF&EMS' current concentration of resources is meeting the NFPA 1710 standard and the OSHA Two-In/Two-Out Rule is also being met on structure fire responses. This is because the OSHA rule is based on the number of firefighters who must be on scene before an entry is made, independent of deployment-based response times. If this is not continued, the department could slide out of compliance with the NFPA standard, and the service level provided to the community will be reduced.

Analysis of the concentration of resources during 2002, 2003, and 2004 led to the following conclusions for objectives for response to residential fire alarms.

- Alarm processing time at the 90th percentile is 1:27, which is over the one-minute alarm processing time objective by 27 seconds.
- Turnout time at the 90th percentile was 1:20, which is over the one-minute turnout time objective by 20 seconds.
- 1st engine travel time at the 90th percentile is 4:37, which is over the four-minute travel time objective by 37 seconds. Since LF&EMS response procedure for a residential fire alarm is the first-due engine company, this also represents the full complement objective.

Table 6.2 **Response Time: Residential Fire Alarms: 2002 -2004**

Residential, Element	Adopted Standard	80th Percentile	90th Percentile	90th Percentile, Total Elapsed Time Since Initial Dispatch
Alarm Processing	1:00	1:19	1:27	
Turnout, First in Engine	1:00	1:10	1:20	
Travel, First in Engine	4:00	4:23	4:37	5:57
Travel, First in Truck	N/A	N/A	N/A	N/A
Travel, Full Complement	4:00	4:23	4:37	5:57
Total Reflex Time (Customer Interval)	6:00	6:52	7:24	

Analysis of the concentration of resources during 2002, 2003, and 2004 led to the following conclusions for objectives for response to commercial fire alarms.

- Alarm processing time at the 90th percentile is 1:18, which is over the one-minute alarm processing objective by 18 seconds.
- Turnout time at the 90th percentile was 1:13, which is over the one-minute turnout time objective by 13 seconds.
- 1st engine travel time at the 90th percentile is 3:37, which is under the 4-minute travel time objective by 23 seconds.
- 1st truck travel time at the 90th percentile is 4:49, which is under the 8-minute travel time objective by 3:11.
- The department met the deployment objective of 6 firefighters on scene within 10 minutes total reflex time for commercial fire alarms by 2:44.

Table 6.3 **Response Time: Commercial Fire Alarms: 2002-2004**

Commercial, Element	Adopted Standard	80th Percentile	90th Percentile	90th Percentile, Total Elapsed Time Since Initial Dispatch
Alarm Processing	1:00	1:13	1:18	
Turnout, First in Engine	1:00	1:05	1:13	
Travel, First in Engine	4:00	3:21	3:37	4:50
Travel, First in Truck	8:00	4:32	4:49	6:02
Travel, Full Complement	8:00	4:13	4:45	5:58
Total Reflex Time (Customer Interval)	10:00	6:31	7:16	

Analysis of the concentration of resources during 2002, 2003, and 2004 led to the following conclusions for objective for response to EMS – Emergent calls for service.

- Alarm processing time at the 90th percentile is 1:09, which is over the one-minute alarm processing time objective by 9 seconds.
- Turnout time at the 90th percentile is 1:09, which is over the one-minute turnout time objective by 9 seconds.

- 1st engine travel time at the 90th percentile is 3:27, which is under the 4-minute travel time objective for basic life support providers to arrive on the scene by 33 seconds.
- Travel time at the 90th percentile for the medic units is 4:43, which is under the 8-minute travel time objective for advanced life support providers to arrive on the scene by 3:17 seconds.
- LF&EMS met the deployment objective for having a basic life support team on the scene within a 6-minute total reflex time by 15 seconds and an advanced life support team on the scene within a 10-minute total reflex time objective by 2:59.

Table 6.4 **Response Time: EMS – Emergent: 2002-2004**

EMS - Emergent	Adopted Standard	80th Percentile	90th Percentile	90th Percentile, Total Elapsed Time Since Initial Dispatch
Alarm Processing	1:00	1:01	1:09	
Turnout, First in Engine	1:00	1:00	1:09	
Travel, First in Engine	4:00	3:16	3:27	4:36
Travel, First in Medic	8:00	4:06	4:43	5:52
Total Reflex Time (Customer Interval)	10:00	6:07	7:01	

Analysis of the concentration of resources during 2002, 2003, and 2004 led to the following conclusion for objective for response to EMS – Urgent calls for service.

- Alarm processing time at the 90th percentile is 1:25, which is over the one-minute alarm processing time objective by 25 seconds.
- Turnout time at the 90th percentile was 1:19, which is over the one-minute turnout time objective by 19 seconds.
- 1st medic unit travel time at the 90th percentile is 5:20, which is over the four-minute travel time objective by 1:20. Since LF&EMS response procedure for a EMS – Urgent incident is the first-due medic unit, this also represents the full complement objective.

- 1st medic unit total reflex time at the 90th percentile is 8:04, which is over the six (6)-minute total reflex time objective by 2:04.

Table 6.5 **Response Time: EMS – Urgent: 2002-2004**

EMS - Urgent	Adopted Standard	80th Percentile	90th Percentile	90th Percentile, Total Elapsed Time Since Initial Dispatch
Alarm Processing	1:00	1:14	1:25	
Turnout, First in Medic	1:00	1:05	1:19	
Travel, First in Medic	4:00	4:30	5:20	6:39
Total Reflex Time (Customer Interval)	6:00	6:49	8:04	

Analysis of the concentration of resources during 2002, 2003, and 2004 led to the following conclusions for objective for response to hazardous materials calls for service.

- Alarm processing time at the 90th percentile is 1:32, which is over the one-minute alarm processing time objective by 32 seconds.
- Turnout time at the 90th percentile is 1:12, which is over the one-minute turnout time objective by 12 seconds.
- 1st engine travel time at the 90th percentile is 4:18, which is over the 4-minute travel time objective for basic life support providers to arrive on the scene by 18 seconds.
- The hazardous materials unit is usually dispatched either after the arrival of the first unit to confirm the presence of a hazardous materials scene or after the dispatcher receives additional information that upgrades the response. Nonetheless, the travel time for the hazardous materials unit at the 90th percentile is 7:09, which is under the 10:00 travel time objective by 2:51.
- LF&EMS met the deployment objective for having an effective response force on the scene of a hazardous materials emergency in 12-minute total reflex time is met with a total reflex time of 9:53 at the 90th percentile.

Table 6.6 **Response Time: Hazardous Materials Incidents: 2004-2004**

Hazardous Materials	Adopted Standard	80th Percentile	90th Percentile	90th Percentile, Total Elapsed Time Since Initial Dispatch
Alarm Processing	1:00	1:18	1:32	
Turnout, First in Engine	1:00	1:04	1:12	
Travel, First in Engine	4:00	3:34	4:18	5:30
Travel, Haz Mat Unit	10:00	6:23	7:09	8:21
Travel, First in Rescue	8:00	6:31	6:43	7:55
Travel, First in Medic	8:00	6:22	6:50	8:02
Travel, First in Battalion Chief	8:00	4:45	5:11	6:23
Total Reflex Time (Customer Interval)	12:00	8:45	9:53	

Analysis of the concentration of resources during 2002, 2003, and 2004 led to the following conclusions for objective for response to technical rescue calls for service.

- Alarm processing time at the 90th percentile is 2:00, which is over the one-minute alarm processing time objective by 1 minute.
- Turnout time at the 90th percentile is 0:57, which is under the one-minute turnout time objective by 3 seconds.
- 1st engine travel time at the 90th percentile is 4:58, which is over the 4-minute travel time objective by 58 seconds.
- The technical rescue unit is usually dispatched either after the arrival of the first unit to confirm the presence of a technical rescue scene or after the dispatcher receives additional information that upgrades the response. The travel time for the technical rescue unit at the 90th percentile is 15:33, which is over the 12-minute travel time objective by 3:33.
- LF&EMS does not meet the deployment objective for having an effective response force on the scene of a technical rescue emergency in 14-minute total reflex time with a total reflex time of 18:30 at the 90th percentile.

Table 6.7 **Response Time: Technical Rescue Incidents: 2002-2004**

Technical Rescue	Adopted Standard	80th Percentile	90th Percentile	90th Percentile, Total Elapsed Time Since Initial Dispatch
Alarm Processing	1:00	1:36	2:00	
Turnout, First in Engine	1:00	0:48	0:57	
Travel, First in Engine	4:00	3:46	4:58	5:55
Travel, Tech Rescue Unit	12:00	13:21	15:33	16:30
Travel, First in Rescue	8:00	6:40	8:19	9:16
Travel, First in Medic	8:00	4:35	5:48	6:45
Travel, First in Battalion Chief	8:00	2:26	4:17	5:14
Total Reflex Time (Customer Interval)	14:00	17:57	18:30	

As was previously discussed, demand for emergency services varies significantly depending on the time of day. The LF&EMS may wish to attempt to improve in the area of medic unit response by modifying its deployment of units according to measurable peak demand periods. Peak activity ambulance deployment improves resource distribution through the practice of dynamic up-staffing during peak periods and down-staffing during statistically low call volume periods. Peak activity ambulances also improve resource concentration by providing extra resources within the system that are deployed into population concentrations such as the downtown core area during business hours. This is especially useful during hours when heavy traffic impedes responding apparatus.

Factors That Have Affected Response

Topography and Transportation Network

Two of the most significant factors affecting the LF&EMS' responses include natural and manmade barriers. As stated in Chapter 4, *Risk Assessment,* the rolling (and often steep) terrain dictates the areas of development throughout the city.

The transportation networks connecting these areas of development are also affected by the terrain. The transportation network of Lynchburg is far from being a "gridded" system often seen in more urban areas. It can be noted from viewing maps of response zones with transportation routes marked that areas that are either not covered or are just within a four-minute travel time boundary could be provided with a quicker travel time if the transportation routes appropriately connected the various areas of development.

For example, Lynchburg's newest and fastest growing development – Wyndhurst – can not be reached within the four-minute response time goal simply because of the transportation routes that allow access to the development. Having opportunities exist to provide additional transportation routes into the community, if public safety is of public concern to the residents and property owners of the community and to the elected officials who represent them.

The Wyndhurst community can also be used as an example of areas of the City where department responses require travel into a neighboring county and then back into the City because of transportation routes. When entering into the neighboring counties, emergency responders actually travel through areas that are serviced by volunteer fire and EMS agencies of those counties. This actually presents an opportunity for regional cooperation with surrounding counties for automatic aid agreements to avoid duplication or overlapping of service deliveries. Of particular importance is the fact that the volunteer agencies are rarely staffed at levels that would allow those agencies to provide resources in order to meet the adopted total reflex time response goals. In short, the county residents would actually benefit more than city residents.

Additionally, the limited access Route 29 Expressway limits the ability of some companies to reach incident scenes within specified goals because of the limited points where the Expressway can be "crossed." Currently, the only two points that allow for easy access across the Expressway are Campbell Avenue/Kemper Street and Candler's Mountain Road.

Training

In the past three years, the Department has realized a significant increase in the amount of on-duty training opportunities. This was the result of strategies identified in the department's strategic plan and also as a result of limiting the

amount of compensatory time and overtime liability associated with members obtaining necessary training while off-duty. Training opportunities are usually coordinated at the Central Virginia Regional Emergency Services Training Center or at Fire Administration. The training center is located on property adjacent to the Lynchburg Regional Airport, located in Campbell County. Training is also conducted in a manner to maximize the efficient use of instructor time and cost, by conducting training for half of the on-duty units at one time and later for the other half. As a result, there is a higher incidence of units being out of service or out of position to respond in a manner which meets the total reflex time response goals. Attempts to coordinate on-duty training sessions with fewer resources placed "out-of-service" and "out of position" to assist in meeting total reflex time response goals should be explored. Although anticipated to be very costly, the feasibility of a more centralized training facility within the City should be evaluated.

Retirements and Paid-Time Off

The City of Lynchburg's annexation of portions of Bedford and Campbell County in 1975-76 resulted in the need for additional fire protection in the annexed areas. In order to accomplish this, there was a need to construct two additional fire stations (Lakeside Drive and Old Graves Mill Road Stations) and hire additional staffing for each of those stations. As a result of the large number of members hired at that time and the institution of an early retirement option after twenty-five (25) years of service under the Virginia Retirement System, there have been and will continue to be a significant number of retirements from the department. This has resulted in staffing shortages which has left equipment out of service on numerous occasions.

Another reason for units being out of service has been the number of members with large balances of annual leave or compensatory time. The current leave scheduling system coordinated by the Battalion Chiefs allows for six members to be off on a daily basis (advanced scheduling). However, because of changes in the Fair Labor Standards Act, Battalion Chiefs are "exempt employees" and are not included in the leave scheduling process. They now are allowed to schedule themselves off as deemed appropriate. These circumstances, in addition to unforeseen reasons such as sick leave, funeral leave, and military deployments, result in the number of days that at least one piece of apparatus (usually an engine company) being placed out of service on a routine basis.

Responding to Change

The safety of the public and firefighters must remain a priority when apportioning additional resources and planning for the future. With the ever-increasing challenges posed by rising costs and revenues that have not in recent years kept pace with the department's cost curve, fire managers are faced with constructing response plans that stretch response resources and personnel. The balance is to achieve efficiency while still meeting the safety standards such as the OSHA-mandated Two-In/Two-Out rule and NFPA 1710.

In addition, there is the concept of deploying additional response resources during periods of peak activity to increase concentration of resources and response reliability, while decreasing response time. What makes this deployment model attractive is the matching of additional resources during periods of increased call volume, when needed, which also coincides with traditional periods of on-duty training and periods of high traffic congestion which slows response. At the same time the cost for staffing a peak activity unit is significantly less than staffing a uniformly deployed 24/7 response company or unit.

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